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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Pin seamed fabric.**

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EP-A-0 011 977
DE-A-2 164 700
DE-A-2 437 303
US-A-2 883 734
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Description

Background of the Invention

In the past fabrics for papermaking machines, such as forming fabrics, dryer fabrics and felts, have been supplied as open-ended flat fabrics, and after installation on the papermaking machine the ends of the fabric were joined or rewoven into endless form. Reweaving is an extremely tedious manual operation which results in substantial down time for the papermaking machine.

To overcome the need for reweaving the fabric on the papermaking machine, pin seamed fabrics have been utilized. With the pin seamed fabric, loops are attached to the ends of the fabric and a pin is inserted through the interdigitated loops to provide a connection. The pin seamed fabric has the advantage that it can be opened and installed on the papermaking machine and the pin then inserted through the interdigitated loops to provide the endless configuration.

In one common form of pin seamed fabric, metal loops are connected by clips to the end of the fabric. Due to the thickness of the metal clips, it is necessary to add weft yarns adjacent the clips in order to taper the thickness from the metal clips to the body of the fabric. Increasing the number of weft yarns in the region of the pin seam decreases the permeability in this region and also increases the thickness. The increased thickness makes the fabric unsuitable for use as a papermaker's felt due to the fact that the felt, in operation, is passed through a nip between pressure rolls to extract water from the paper web.

In the past, the pin seamed fabrics have also been formed through use of spiral plastic members which were woven into the ends of the fabric. As in the case of the metal loops, the plastic spiral loops produce an increase in thickness in the seam area and a decrease in permeability.

In an attempt to provide more uniformity in porosity and thickness in the pin seamed area, woven back structures have been utilized. In a woven back structure, the weft yarns in the end of the fabric are removed and the projecting warp yarns are then folded back to form loops and interwoven with the fabric. United States Patents Nos. 2,325,900, 3,436,041, 4,026,330, 4,095,622, 4,182,381 and 4,401,137 show various types of woven back fabrics.

However, in the woven back fabric, problems have been encountered in retaining the integrity of the loops formed by the woven back warp yarns because the woven back yarns tend to slip or loosen. Furthermore, severing the warped yarns in the woven back structure seriously impairs the strength of the fabric, as opposed to a fabric using continuous non-broken yarns.

As a further disadvantage, additional weft yarns are required in the area of the pin seam in order to adequately hold the woven backwarp yarns in position, so that the loops do not elongate. The addition of the added weft yarns decreases the porosity of the fabric in the area of the pin seam, as well as providing an increase in thickness.

Papermaking fabrics have also been woven in endless form without a seam and an endless fabric has the inherent advantage of uniform porosity and thickness throughout its length. Endless fabrics, however, present certain problems in installation on the papermaking machine. To install the endless fabric, it is necessary to shift the roll mountings and slip the fabric over the rolls. Recently, due to the advent of stiffer, bulkier fabrics the problem of installation of an endless felt has been accentuated. The installation of an endless fabric on a papermaking machine is a timeconsuming operation which requires substantial down time for the machine.

German patent application 2164700 discloses a fabric wherein certain of the aforementioned disadvantages are obviated. In DE-A-2164700 a warp yarn is woven with parallel weft elements one of which is a removable pin. However every pick of the warp yarn defines a loop extending around the removable pin and this is disadvantageous in that the thickness of the fabric is increased in the region of the pin seam produced when a pin is introduced through all of the loops. Such increase in thickness in the region of the pin seam causes the endless fabric, when used for example in papermaking, to exhibit non-uniform water extraction characteristics. Thus it is an object of the present invention to provide a fabric having substantially uniform fabric density and porosity throughout its length and a method of manufacturing the fabric, wherein the aforementioned disadvantages are obviated.

In accordance with the present invention there is provided an endless pin seamed fabric, comprising a woven fabric, including a plurality of parallel weft elements and a single continuous warp yarn interwoven with said weft elements, said weft elements including a pin and adjacent yarns on either side of said pin, said warp yarn being interwoven with said weft elements in a plurality of picks, every other pick being looped around the pin so forming a plurality of first loops and alternate picks being looped around adjacent yarns so forming a plurality of second loops offset from said first loops, said pin being removable from said first loops to enable the felt to be open to a generally flat condition.

In accordance with a second aspect of the invention there is provided a method of producing an endless pin seamed fabric, comprising the steps of arranging a group of weft yarns in a parallel pattern, disposing a pin parallel to said group of weft yarns, interweaving a single continuous warp yarn with said weft yarns in a series of picks and looping the warp yarn around the pin in every other pick and looping the warp yarn around a weft yarn adjacent to said pin in every alternate pick.

After the weaving operation has been completed, the pin can be removed so that the fabric can be opened up and readily installed on the papermaking machine. After installation, the pin

can be reinserted through the interdigitated loops on the ends of the fabric.

The fabric of the invention has a uniform porosity in the area of the pin seam and a constant thickness. Thus, the fabric has the inherent advantages of an endless fabric, and due to the pin seam, can be readily opened up and installed on the papermaking machine.

As a further advantage, the fabric includes a single continuous warp yarn which is unbroken and this not only increases the strength of the fabric, but also prevents the loops from elongating in service, as can occur with the woven back type of loop construction.

While the fabric of the invention can be used as a forming fabric, or dryer fabric, it has particular use as a papermaker's felt due to the fact that the thickness in the area of the pin seam is not increased and the porosity in this area is uniform.

Other objects and advantages will appear in the course of the following description.

Description of the Drawings

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

Fig. 1 is a plan view of the pin seam area of a fabric in accordance with one example of the invention,

Fig. 2 is a section taken along line 2-2 of Fig. 1; and

Figs. 3A-3H are schematic representations illustrating showing the picks of the warp yarn in the weaving operation.

Description of the Illustrated Embodiment

Fig. 1 shows a pin seamed fabric 1 that has particular use as a fabric for a papermaking machine. More particularly, the fabric can be used as a papermaker's felt or as a forming fabric or dryer fabric.

Fabric 1 includes an array or plurality of parallel weft yarns 2, and a single, continuous warp yarn 3 is interwoven with the weft yarns. Certain picks or passes of the warp yarn 3 form projecting loops 4 and a pin 5, formed of plastic or metal, is inserted through the aligned interdigitated loops 4 to connect the ends of the fabric together.

As set forth in the specification and claims, the term "warp yarn" is used as in papermaker's terminology in which the warp yarns extend longitudinally of the fabric or in the machine direction.

The term "yarn" as used in the specification and claims is intended to include strands of monofilament, multifilament, fiber materials, or mixtures of these materials in either twisted, untwisted, intertwined, or plied form.

The yarns can be formed of any desired materials, such as wool or synthetic materials, but it is preferred that the warp yarn 3 be formed of a material which will tend to retain the integrity of the loops 4 when the pin 5 is removed.

Figs. 3A-3H illustrate the endless weaving pattern for forming a two-layer fabric. While Figs. 3A-3H for purposes of illustration, merely show five vertical rows of weft yarns 2, in practice there may be hundreds or thousands of rows of weft yarns depending upon the length of the endless fabric to be produced.

As shown in Fig. 3A, the pin 5 is positioned parallel to an end yarn in the array of weft yarns 2, and in the first pick, the warp yarn 3 is interwoven with the weft yarns of the upper layer. Fig. 3A shows the warp yarn 3 going over and under adjacent weft yarns 2, but it is contemplated that any desired weaving pattern can be employed.

While Fig. 3A-3H shows the warp yarn 3 moving in a sinusoidal path, in practice the weft yarns 2 would be raised and lowered by harnesses to the desired position, and the warp yarn would be moved horizontally by a shuttle in a straight path to provide the interweaving.

As shown in Fig. 3B, warp yarn 3 is looped around pin 5 to form a loop 4 and is then interwoven in the upper layer of weft yarns 2 in a return or second pick.

Following this, the warp yarn 3 is interwoven in a third forward pick with the weft yarns of the lower layer (Fig. 3C), and the warp yarn is then looped around the end weft yarns in the lower layer and interwoven with the weft yarns of the lower layer in a return pick, as shown in Fig. 3D.

Following the return pick, the warp yarn 3 is again interwoven with the weft yarns 2 of the upper layer, as illustrated in Fig. 3E and is then interwoven in a return pick as illustrated in Fig. 3F.

Warp yarn 3 then is interwoven with the weft yarns of the lower layer in a forward pick (Fig. 3G) and is looped around the pin 6 to form a second loop 4 and interwoven with the weft yarns in the lower layer in a return pick, as illustrated in Fig. 3H. This pattern is repeated throughout the width of the fabric.

While Figs. 3A-3H show the weft yarns 2 arranged in four vertical rows (indicated by 2a-2d in Fig. 3A) to form a double layer fabric, it is contemplated that the weft yarns can also be arranged in only two rows in which case a single layer fabric can be produced.

The resulting woven structure is an endless fabric in which certain picks or passes of the single continuous warp yarn 2 are looped around the pin 5. By removal of pin 5, the fabric can be opened up and conveniently installed on the papermaking machine. After installation, the pin can be reinserted within the aligned interdigitated loops 5.

The woven fabric of the invention has particular use as a base fabric for a papermaker's felt.

In this situation, one or more layers of fibrous batt can be needled into one or both surfaces of the base fabric. The needling operation may tend to damage the pin 5, so that after needling, the damaged pin can be removed and when the felt is installed on the papermaking machine, a new pin can be replaced.

The fabric of the invention has a constant thickness and permeability adjacent the pin seam. As the warp yarn is continuous, the fabric has

improved strength over woven back types of fabric in which the warp yarns are severed.

The fabric can be readily woven on a standard weaving loom and no special equipment is required. Furthermore, the loop construction is made during the regular weaving process, so that the pin seamed fabric can be produced in a substantially shorter period of time than other pin seamed fabrics utilizing metal clips, plastic spirals, or woven back warp yarns.

Claims

1. An endless pin seamed fabric, comprising a woven fabric (1), including a plurality of parallel weft elements (2) and a single continuous warp yarn (3) interwoven with said weft elements (2), said weft elements (2) including a pin (5) and adjacent yarns on either side of the pin, said warp yarn (3) being interwoven with said weft elements (2, 5) in a plurality of picks, characterized in that every other pick is looped around the pin (5) forming a plurality of first loops (4) and alternate picks are looped around adjacent yarns (2) forming a plurality of second loops offset from said first loops (4), said pin (5) being removable from said first loops (4) to enable the felt to be open to a generally flat condition.

2. A method of producing an endless pin seamed fabric (1), comprising the steps of arranging a group of weft yarns (2) in a parallel pattern, disposing a pin (5) parallel to said group of weft yarns (2), interweaving a single continuous warp yarn (3) with said weft yarns (2) in a series of picks and characterized by looping the warp yarn (3) around the pin (5) in every other pick and looping the warp yarn (3) around a weft yarn (2) adjacent to said pin (5) in every alternate pick.

Patentansprüche

1. Endlosgewebe mit Steckstiftnaht, umfassend ein Gewebe (1) mit einer Mehrzahl von parallelen Schußelementen (2) und einem einzigen fortlaufenden Kettfaden (3), der mit den Schußelementen (2) verwebt ist, wobei die Schußelemente (2) einen Stift (5) und angrenzende Fäden zu beiden Seiten des Stifts umfassen und der Kettfaden (3) mit den Schußelementen (2, 5) in einer Mehrzahl Einschüsse verwebt ist, dadurch gekennzeichnet, daß jeder zweite Einschuß schlaufenartig um den Stift (5) geführt ist unter Bildung einer Mehrzahl erster Schlaufen (4) und wechselweise dazwischenliegende Einschüsse um angrenzende Fäden (2) schlaufenartig geführt sind unter Bildung einer Mehrzahl zweiter Schlaufen, die gegenüber den ersten Schlaufen (4) versetzt sind, und daß der Stift (5) aus den ersten Schlaufen (4) entfernbar ist, so daß der Filz zu einem im wesentlichen flachen Zustand geöffnet werden kann.

2. Verfahren zur Herstellung eines Endlosgewebes (1) mit Steckstiftnaht, umfassend die Schritte: Anordnen einer Gruppe Schußfäden (2) zu einem parallelen Muster, plazieren eines Stifts (5) parallel zu dieser Gruppe Schußfäden (2), Verweben eines einzigen fortlaufenden Kettfadens (3) mit den Schußfäden (2) in einer Serie von Einschüssen, gekennzeichnet durch schlaufenförmiges Führen des Kettfadens (3) um den Stift (5) in jedem zweiten Einschuß und schlaufenförmiges Führen des Kettfadens (3) um einen an den Stift (5) angrenzenden Schußfaden (2) in jedem wechselweise dazwischenliegenden Einschuß.

Revendications

1. Tissu sans fin a couture a broche, constitue d'un produit tissé (1) comprenant une pluralité d'éléments de trame parallèles (2) et un seul fil de chaîne continu (3) entrelacé avec les éléments de trame (2), les éléments de trame (2) comprenant une broche (5) et des fils voisins de chaque côté de la broche, le fil de chaîne (3) étant entrelacé avec les éléments de trame (2, 5) en une pluralité de jets, caractérisé en ce qu'un jet sur deux est enroulé en boucle autour de la broche (5), formant une pluralité de premières boucles (4), tandis que l'autre jet est à chaque fois enroulé autour des fils voisins (2), formant une pluralité de deuxièmes boucles décalées par rapport aux premières boucles (4), la broche (5) pouvant être déposée des premières boucles (4) pour permettre au feutre d'être ouvert à un état globalement plat.

2. Procédé de fabrication d'un tissu sans fin à couture à broche (1), comprenant les étapes consistant à arranger un groupe de fils de trame (2) en un modèle parallèle, à disposer une broche (5) parallèlement au groupe de fils de trame (2), à entrelacer un seul fil de chaîne continu (3) avec les fils de trame (2) en une série de jets, et caractérisé par l'étape consistant à enrouler en boucle le fil de chaîne (3) autour de la broche (5) dans un jet sur deux, et à enrouler en boucle le fil de chaîne (3) autour d'un fil de trame (2) voisin de la broche (5) dans chaque autre jet.

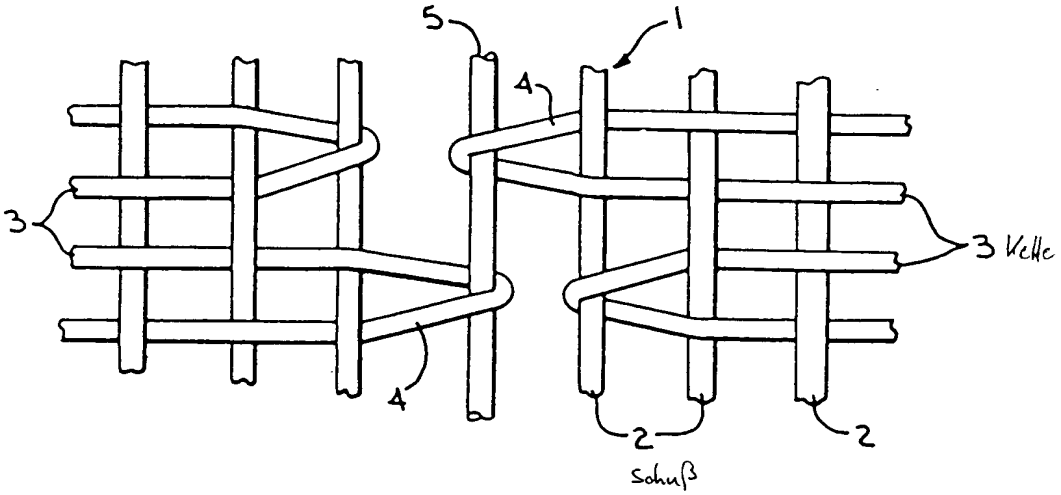

FIG. 1

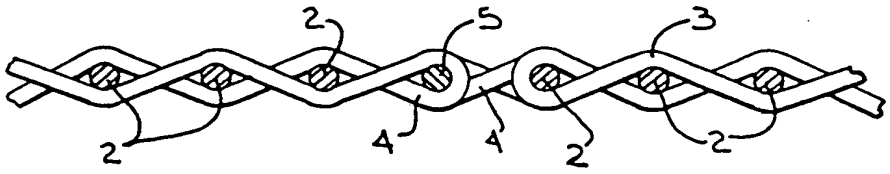

FIG. 2

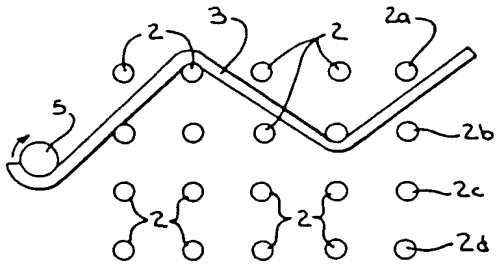

FIG. 3A

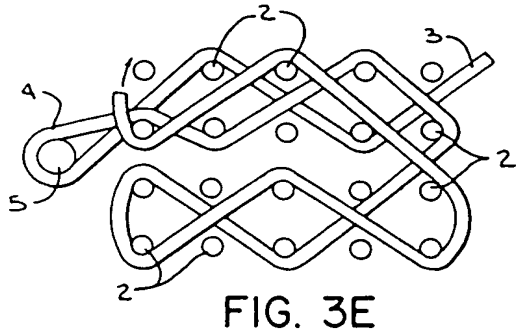

FIG. 3E

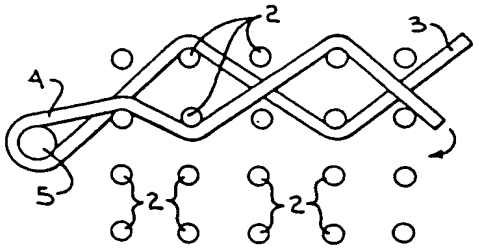

FIG. 3B

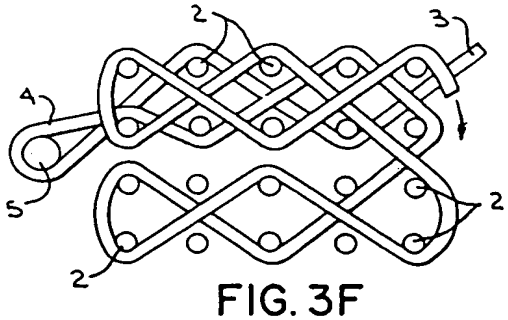

FIG. 3F

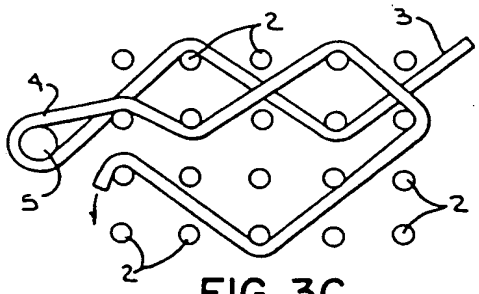

FIG. 3C

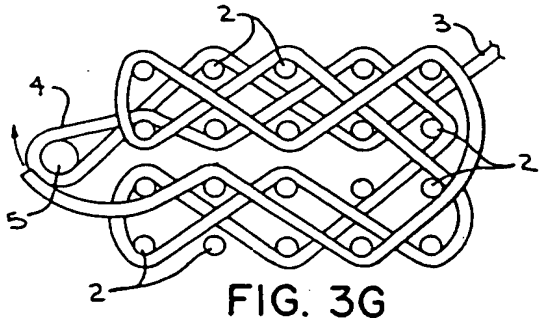

FIG. 3G

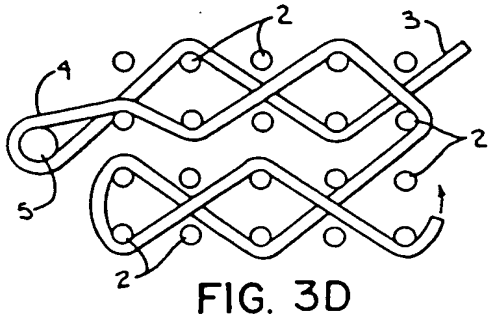

FIG. 3D

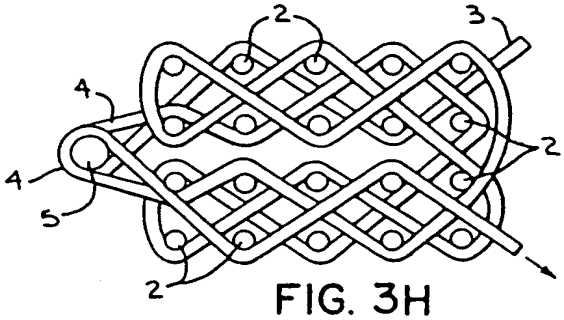

FIG. 3H